

## Defining proximal soil sensing (a presentation to encourage discussion)

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## Motivation

To figure out what's missing and where we should be heading

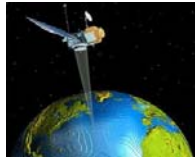
What exactly is proximal soil sensing (PSS)?

We think that it is important to reconsider this question so that this dynamic new discipline develops widely and rapidly.

## Modalities



*Proximal v Remote*



## Modalities



*In situ v Ex situ*



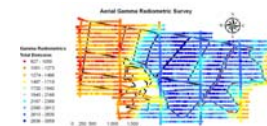
## Modalities



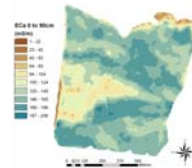
*Non-invasive v Invasive*




## Modalities






*Passive v Active*







## Modalities


### *Mobile v Stationary*









## Putting it together

Mode a	Location	Mode b	Mode c	Mode d	Mode e
In-situ	Field	Invasive	Active	Mobile	NIR tine, disc resistivity
				Stationary	TDR, neutron probe
			Passive	Mobile	Strength tine, penetrometer
				Stationary	Temp probe
		Non-invasive	Active	Mobile	GPR, EMI, optical
				Stationary	Surface gamma probe
				Passive	Mobile
			Passive	Stationary	Gamma radiometry optical



## Putting it together


Ex-situ	Location	Invasive	Active	Stationary	Methods		
	Field	Invasive	Active		Sampler pH electrode, field chem. Lab, NIR		
				Stationary	Field texture (by hand)		
			Passive		Sampler /radiation		
				Stationary	----		
		Non-invasive	Active			----	
				Stationary	----		
				Passive		----	
			Passive				----
				Stationary		Munsell colour book	
				Lab	Invasive	Active	Stationary
Non-invasive	Lab	Non-invasive	Active	Stationary	NIR MIR		
			Passive	Stationary	Gravimetric methods		



## Do we want a narrow or wide definition of proximal soil sensing?

*Proximal soil sensing, sensu stricto* In the narrow sense one could define PSS as **in-situ, mobile, field methods** or more widely **in-situ and ex-situ, mobile, field methods**.

*Proximal soil sensing, sensu lato* More widely one could define PSS as **in-situ and ex-situ, mobile and stationary field methods**.



## Conclusions

- Proximal soil sensing can be defined by a set of modalities. The list given here is not exhaustive.

DISCUSSION Are there any others?

## Conclusions



- Using these modalities a narrow definition of PSS is a set of in-situ and ex-situ, mobile, field soil measurement methods

DISCUSSION Too narrow?

## Conclusions



- A wider definition of PSS includes in-situ and ex-situ, mobile and stationary field methods. The wider definition perhaps gives more scope for the development of PSS methods and cross-fertilisation between modalities.

DISCUSSION Too wide or not wide enough?

## Conclusions



- We question whether laboratory-based methods constitute PSS. Nevertheless, understanding laboratory NIR and MIR will inform their improved use in the field.

DISCUSSION What do others think?

## Conclusions



- A cost-effective proximal sensing modality that allows repeated high-resolution soil measurement over time and space appears to be one of the major development challenges.

DISCUSSION Possible?

## Multi-Sensor Platform



The future for PA offers automation, miniaturisation and continuous operation

